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Article

Interaction-With-Interference (I∩I): Unconcealing The Illusion of Media Spectacle in Quantum-Like Society

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Abstract: In the digital age, media spectacle relies on images and illusions to shape perception and judgement, yet interactive interference in communication remains underexplored. UNESCO's promotion of art-based quantum literacy has reshaped Scientific Aesthetics. The metaphor of a Quantum Society, rooted in superposition, entanglement, uncertainty, and emergence, offers a critical lens on social structures and behaviours but has rarely been integrated with media-spectacle studies, leaving gaps on how interactive media and interference shape social dynamics and aesthetic experience. This research advances Interaction-with-Interference (I∩I) to examine how interference modulates information flow, exposes the illusion of spectacle in a quantum-like society, and characterises interactive spectacle, including user participation, immersion, and quantum-inspired design, while foregrounding the creative potential of interference aesthetics in interactive animation. Methods combined theoretical analysis of spectacle's evolution with an empirical programme: a one-minute PDTM (Preference and Dwell-Time Measurement) comparing dynamic for A/B Choice, quantum-inspired elements (uncertainty, randomness, superposition) to static controls; a questionnaire probing quantum concepts as artistic inspirations; and qualitative interviews on media interaction and interference. Results show increased interaction time in the dynamic environment, with 67.1% preferring it; the survey identified Uncertainty and Superposition as top inspirations; interviews highlighted addiction, filter bubbles, and misinformation, alongside creative affordances of interference aesthetics. We conclude that I∩I offers a novel interdisciplinary perspective in which interaction and interference are inherently integrated, reframing interference as vital to creativity and guiding interactive design that harmonises technological advances with humanistic values.

Keywords: Media Spectacle; Digital Illusion I∩I, quantum aesthetics, interactive animation, IYQ.

Introduction

The introduction outlines the nature, purpose, and contribution of the research, alongside references to prior work. Media spectacle, evolving from its Latin roots (spectaculum, 'a show'), has become a defining feature of the digital age, centred on images and illusions that manipulate human perception (Han, 2017, p. 27; Zhao et al., 2024, p. 135). Guy Debord's (1970, p. 16) 'Social Spectacle' framed images as agents of social control, drawing on Marxist commodity fetishism (Marx & Engels, 1887, p. 48), while Douglas Kellner extended this to 'Media Spectacle' by highlighting high-tech media's role in producing and deploying spectacle within specific historical contexts (2003, p. 29). Today, digital tools have birthed 'Interactive Spectacle,' which grants

users an 'illusion of agency' through real-time engagement, yet the interaction with interference in this paradigm requires further investigation.(O'Neill, 2009, p. 182; Zhao et al., 2025a, p. 56, 2025b, p. 139). In the International Year of Quantum Science and Technology (IYQ 2025), UNESCO emphasised that quantum mechanics can reshape artistic expression and perception within Scientific Aesthetics.

This research addresses three critical gaps: first, the lack of a framework to systematically analyse interaction-interference dynamics, herein dubbed I∩I; second, the limited application of Quantum-like Society principles (superposition, entanglement) to media spectacle research (Schweitzer, 2018, p. 41; Wendt, 2015, p. 4); third, the under recognition of interference's creative potential in interactive art (Eustáquio & Carvalhais, 2017, pp. 143, 148). Its core contribution lies in integrating philosophical, psychological, and quantum perspectives to unpack media spectacle's illusions and redefine interference as a dialectically unified dualistic force, both disruptive and generative.

Literature Review

The literature review clusters around three interconnected themes. First, spectacle evolution: Debord's Social Spectacle posits images replace tangible reality, with Heidegger's 'Being-ready-to-hand' (2007, p. 113) critiquing overreliance on semiotic interpretations of this phenomenon; Kellner's Media Spectacle narrows focus to media's active role in spectacle production; and contemporary Interactive Spectacle, defined by digital and multimedia features, shifts users from passive observers to 'agentic' participants (Baecker, 1969, p. 2; Nusselder, 2009, p. 4).

Second, In Interaction-with-Interference (I∩I), Perceptual Interference (Sensory & Imaginative) draws on James (1890, p. 409), Taine (1871, p. 98,111.267), Rovelli et al. (2021, p. 128), Whitehead (1968, p. 95), Weeks (2019, p. 23), Eriksen & Schultz (1978, p. 8), Lloyd-Jones & Vernon (2003, p. 577), Bellemare-Pepin et al. (2022, p. 1), Blom (2010, p. 6), Conrad (1966, p. 7), Fish(1960, p. 4), and Mishara (2010, p. 11); Mnemonic Interference (Memory-Based) relies on Plato (1924, p. 266), Bartlett (1932, p. 264), Hume (1739, p. 14), Bergstrom (1893, p. 356), Kahana (2012, p. 122), and Beaty et al. (2017, p. 14); Social Interference (Collective & Cultural) involves Marcus Aurelius (2006, p. 143) Lippmann (1922, p. 87), Noelle-Neumann (1984, p. 144), Nusselder (2009, p. 77), Feuerbach (1854, p. xii), and Bacon (2000, p. 40, 1902, p. 79). Detailed Core Perspectives of Interaction-with-Interference (I∩I) as shown in Table 1.

Third, Quantum Society: Auguste Comte's (1853, p. 4) 'Social Physics' laid groundwork for applying physical principles to social dynamics, with Alfred North Whitehead (1978, p. 309) later proposing 'quantum-like energy flows' in natural processes. Modern Quantum Society research uses principles like complementarity (Bohr, 1939, pp. 270, 271) and 'undivided wholeness' (Bohm et al., 2006, pp. 86, 271) to bridge micro-scale (consciousness) and macro-scale (societal) dynamics, offering a lens to unpack digital media's complexity (Dunk, 2020, pp. 2, 9; Rovelli et al., 2021, p. 129).

Table1. Categories of interaction with interference (I∩I)

Category	Concept	Scholar(s)	Core Perspective
Perceptual Interference (Sensory & Imaginative)	Attention Displacement	William James	*Selective attention suppresses competing sensations from consciousness.*
	In–Out Corrected	Taine; Rovelli	*Perception as internal hallucination corrected by external sensation..*
	Emotional Disturbance	Whitehead	*Emotions interfere with rational and perceptual clarity.*
	Imaginative Distortion	Weeks	*Mental motion lets imagination distort perception, forming idols.*
	Iconic/ Visual Persistence	Eriksen & Schultz; Lloyd-Jones & Vernon	*Residual imagery affects new perception—temporal interference.*
	Pareidolia / Visual Bias	Bellemare-Pepin; Blom	*The mind imposes familiar patterns onto ambiguous stimuli.*

Mnemonic Interference (Memory-Based)	Apophany Insight	Conrad; Fish; Mishara	*Hallucinations may reflect distorted—but meaningful—internal revelations.*
	Retroactive Interference	Plato	*Later memory imprints overwrite earlier ones—wax tablet metaphor.*
	Remembering Interruption	Bartlett	*Memory is reconstructed, not replayed; interruption is inherent.*
	Associative Interference	Hume; Bergstrom; Kahana	*Interacting ideas modulate and distort each other.*
	Semantic Interference	Beaty et al.	*Language meaning disrupts cognitive fluency or task performance.*
Social Interference (Collective & Cultural)	Internal Interpretation	Marcus Aurelius	*Disturbance arises from internal opinions, not external events.*
	Stereotype Interference	Lippmann; Noelle-Neumann	*Prejudiced mental constructs hinder recognition of shared humanity.*
	Media Disruption	Nusselder	*Digital media fragments sign–referent relationships, blurring reality.*
	Sacred Illusion	Feuerbach	*Illusions, when collectively revered, transform into sacred truths.*
	Cognitive Idols	Francis Bacon	*Mental biases (Tribe, Cave, Marketplace, Theatre) distort clear reasoning.*

Source: Compiled from core literature (1924–2024)

The pyramid categories in Figure 1 organize interference into a hierarchical structure, from individual sensory experiences (Perceptual) to collective cultural phenomena (Social), providing a systematic tool to analyze interaction-interference dynamics in digital media. Key patterns include the pervasiveness of internal interference (e.g., Aurelius' 'internal opinions') and the role of technology in amplifying social interference (e.g., Nusselder's 'media disruption').

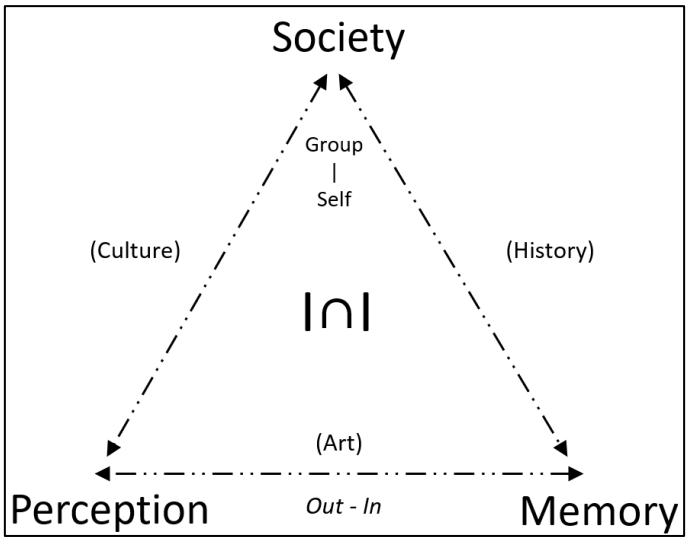

Figure 1. Pyramid of I∩I
Source: Drawing from Categories of Interaction with Interference (I∩I)

Methodology

1. Theoretical Framework Construction
The study integrates three strands of literature: spectacle evolution in media studies, Interaction-with-Interference (I∩I) with philosophical and psychological roots, and Quantum-like Society grounded in uncertainty, superposition, entanglement, and emergence. To operationalise I∩I, a pyramid category system (Table 1) classifies interference into Perceptual, Mnemonic, and Social types derived from 22 core studies across philosophy, psychology, and media studies. This taxonomy guides coding, measurement, and interpretation in the empirical sections.

2. Three Empirical Methods Were Used to Collect and Analyse Data
PDTM for A/B Choice: 307 valid participants engaged with two interactive environments:
Situation A (dynamic, quantum-inspired elements: uncertainty, randomness, superposition, entanglement) and Situation B (static control). A game engine recorded behavioural data (interaction time, preference), which was analysed via Power BI and Jamovi. The 'LagTimer' variable quantified the time difference between duration in two situations, while 'TimerA' measured interactive timeline in Situation A.

Survey
A multiple-choice item asked which quantum concept most inspired artistic creation among Uncertainty, Superposition, Interference, Entanglement, and Emergence, etc. Statistical analysis used chi-squared testing ($\chi^2 = 48.213$, $p < 0.001$) to validate significance.

Interviews: 15 interviewees (4 Continents / 7 Countries) with expertise in media, art, and technology were recruited. Pre-Screening of semi-structured interviews by Tongyi Efficiency (AI platform) and manually verified before QDA. Grounded Theory coding in QualCoder produced the thematic coding which identified three key findings: media addiction/filter bubbles, misinformation dilemma, and interference aesthetics.

3. Ethical Consideration
This study obtained institutional ethics approval from Universiti Teknologi MARA, collected N=307 valid responses via on-site, public venue, and limited international online channels between April 2023 and July 2025. Informed consent was obtained from all participants in empirical studies, adhering to research ethics guidelines. The questionnaire used a two-part: Part 1 (Unity3D WebGL game-like interaction, ≈1 minute) captured behavioural A/B indicators, and Part 2 (Microsoft Forms) collected demographic and rating data.

The Findings
This section presents a concise description of the study's results, using tables and figures to illustrate quantitative and qualitative data, and dividing findings into three subsections for clarity.

1. PDTM for A/B Choice Results
Participants were randomly routed to one of three game-like levels, with each level containing both the A/B situation for comparison. The PDTM (Preference and Dwell-Time Measurement) for A/B Choice revealed a significant difference in user engagement between dynamic and static environments. Situation A (quantum-inspired dynamic elements) showed a mean interaction time of 40.16 s (Median = 38), compared to 19.64 s for Situation B (static non-interaction). Regression analysis showed a positive correlation between TimerA (engagement duration in Situation A) and LagTimer (Time in Situation A minus Time in Situation B), indicating that dynamic elements prolonged user attention. 'A1B-1test' records the avatar's final situation at 60 s (A = 1, B = −1). Additionally, 67.1% (206/307) of participants preferred Situation A 66.93% (TimerA/1 minute), confirming strong aesthetic appeal of quantum-inspired design.

Table 2. Coefficients - TimerA

			95% Confidence Interval			
Predictor	***Estimate***	***SE***	***Lower***	***Upper***	***t***	***p***
Intercept[a]	23.50384	0.510227	22.49980	24.50787	46.0655	6.9761e-139
LagTimer	0.50395	0.011611	0.48110	0.52680	43.4036	4.4508e-132
Level:						
2 – 3	4.04375	0.656408	2.75205	5.33544	6.1604	2.3049e-9
1 – 3	-1.53387	0.701279	-2.91387	-0.15388	-2.1872	0.029489

Source: [a] Represents reference level in A/B Choice data (2024)

Table 2 reports a jamovi linear model of engagement time as a function of lag and level: TimerA = β_0 + β_1·LagTimer + β_2·I (Level = 2) + β_3·I (Level = 1) + ε, with Level 3 as the reference. Model fit was strong (R^2 = .915, adjusted R^2 = .914, N = 307). LagTimer showed a large positive association (β = .50395, SE = .01161, t = 43.40, 95% CI [0.4811, 0.5268], p < .001; standardized $\beta \approx .87$), meaning that each additional second of lag predicted about 0.50 s longer engagement. Relative to Level 3, Level 2 exhibited +4.04 s longer engagement (p < .001), whereas Level 1 was −1.53 s shorter (p = .030), holding lag constant. Diagnostic plots indicated mild heteroscedasticity, so HC3-robust standard errors were reported and conclusions were unchanged.

Figure 2 illustrates the clustering of data points around the trend line, emphasizing the positive correlation between dynamic elements and engagement. The visualization also highlights that over two-thirds of participants favoured the quantum-inspired environment, aligning with the study's hypothesis that uncertainty and randomness are associated with higher perceived interactivity.

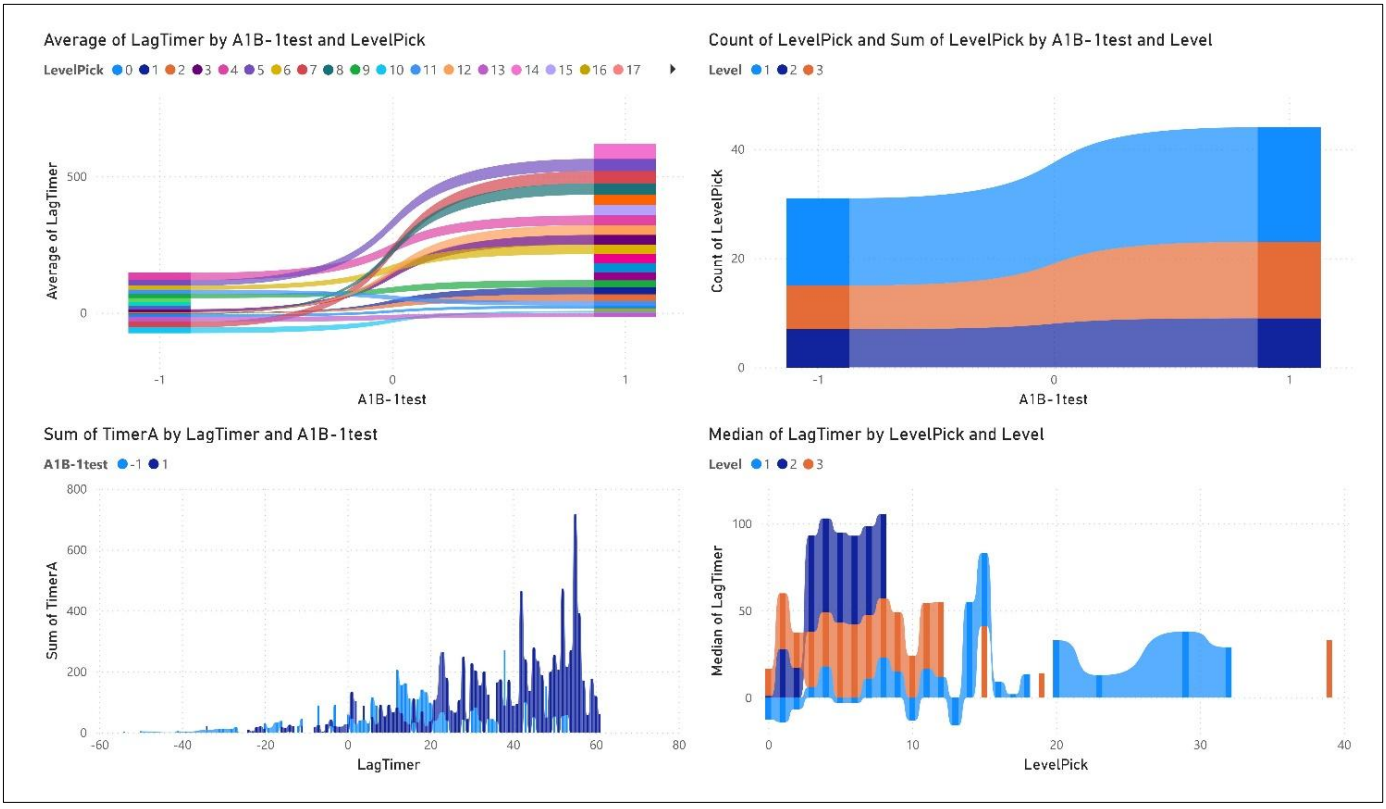

Figure 2. A/B Choice PDTM Data Visualization
Source: A/B Choice data (2025)

2. Survey Results

The survey (*n*=307) identified clear preferences for quantum concepts as artistic inspiration. Popularity Rate of Uncertainty was the most popular (58.63%), followed by Superposition (51.79%), Entanglement (47.56%), Emergence (29.64%), Interference (28.34%). This hierarchy reflects a strong artistic draw to unpredictability (Uncertainty) and multiple coexisting realities (Superposition)—themes that resonate with digital media's capacity to blur fiction and reality.

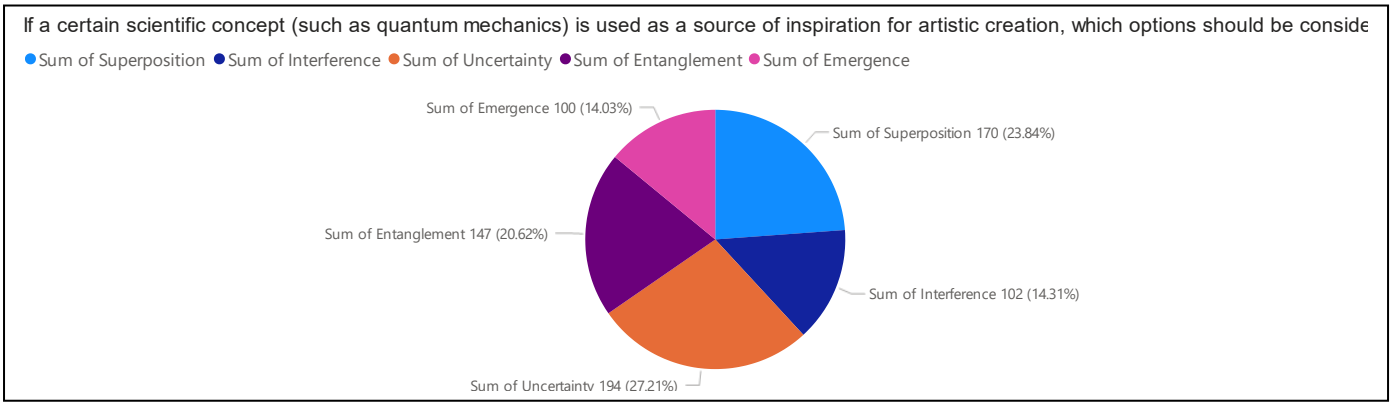

Figure 3. Popularity of Quantum Concepts as Artistic Inspiration
Source: Survey data (2025)

Figure 3 quantifies the survey results, with Uncertainty and Superposition collectively accounting for over half of all responses. This finding supports the integration of quantum principles into interactive art, as these concepts align with artists' desire to explore complexity and novelty.

3. Interview Findings

Thematic coding of the interview data identified three key insights, which are summarized in Table 3. These insights were derived from in-depth discussions with 15 interviewees, whose core professional backgrounds are as follows: Mark (Experimental Animation Director/Researcher), Peter (Generative Art Expert), Niki (New Media Artist/Director), David (3D Animation Artist/Educator), Chuah (Digital Artist/Architect), Ifeo (XR Developer/3D Artist), Kaoru (Interactive Art Creator), Tian (Digital Media Artist), Tsai (Serious Games Researcher), Miao (Multimedia Artist), Yash (Quantum Gamedev Researcher), Razeef (Animation & Media Researcher), Ma (Digital Interaction Artist), Sun (Tech Art Researcher), and Yang (Artificial Intelligence Researcher).

Table 3. Interview themes and keywords

Topic	Interviewee	Keywords/Core Idea
Media Addiction and Filter Bubbles	Niki	'dopamine hits', 'attention as currency' (fuelling screen addiction)
	David	'resistance and addiction-like behaviour', 'secretive engagement' (regarding game addiction)
	Razeef	'wake to sleep' usage, mobile phone as multifunctional tool, embedded in routines
	Chuah	'filter bubbles', 'unaware of data influence' on digital reality
	Yang	'information cocoon' effect, 'filter bubbles' leading to isolation
	Tian	'cognitive adaptation', 'thinking Inertia' (formation under mutual influence)
	Miao	'digital chatting degrades writing'
The Digital Dilemma of Misinformation	Yang	'Bias determined at thought arises', 'survivor cognitive bias'
	Yash	'Cultural misrepresentation' from decontextualized information, 'misinformation'
	Chuah	'power controls bias', 'AI bias shapes techno belief ', 'digital reality dilemma'
	Sun	'malicious data AI bias'
	Ifeo	'overwhelmed by information', desire to disengage from internet
Interference Aesthetic in Interactive Art	Yang	'order in randomness', 'more random more creativity'
	Kaoru	'randomness enhances artistic unpredictability'
	Ifeo	'synaesthesia' adding 'multi-sensory dimension' (via virtual reality)
	Tsai	' AIGC impacts aesthetics', 'images shape beliefs and practices'

Ma	'art's charm lies in randomness, uncertainty'
Mark	'apophenia', 'pareidolia' (cognitive biases)
Peter	'complex behaviour rules' (e.g., point attractors, chaotic patterns)
Niki	'randomness and uncertainty are significant components of play design' (philosophical importance in creating engagement)

Source: Interview data (2024)

Discussion

This section interprets the findings from the perspective of prior studies and the study's working hypotheses, exploring their broader implications and highlighting future research directions.First, the PDTM for A/B Choice results align with Eustáquio & Carvalhais (2017, pp. 139, 148), who argue that interference can be an 'asset improving systems.' The average timeline of engagement with quantum-inspired dynamic elements (40.16s vs. 19.64s) suggests that uncertainty and randomness, often framed as 'disruptive', actually is associated with higher attention. This supports the I∩I framework's core proposition: interference is dualistic, with both detrimental (e.g., addiction) and generative (e.g., aesthetic appeal) roles.

Second, the survey's emphasis on Uncertainty (58.63%) and Superposition (51.79%) as artistic inspiration resonates with David Bohm's (2006, pp. 86, 271) concept of 'undivided wholeness' in quantum theory. Artists' preference for these concepts reflects a desire to capture digital media's complexity, where users experience multiple 'realities' (e.g., social media personas) simultaneously, blurring the line between fiction and reality (Nusselder, 2009, p. 77). This also aligns with Alexander Wendt's (2015, p. 4) claim that 'all intentional phenomena are quantum mechanical,' as digital interactions exhibit quantum-like properties (superposition of identities, entanglement of user behaviours).

Third, interview findings on media addiction and misinformation extend Lippmann's (1922, p. 87) concept of 'stereotypes' as interference. Algorithmic filter bubbles (Chuah's quote) and AI bias (Sun's quote) are modern manifestations of Bacon's (2000, p. 40) 'Idols', biases that distort clear reasoning. However, the interviews also highlight interference's creative potential: Yang's 'order in randomness' and Ifeo's 'synesthesia' suggest how interactive art can harness interference to foster innovation, echoing Beyls' (1991, p. 311)argument that 'without chaos there cannot be creativity'.

Limitations of the study include the geographic homogeneity of participants in survey (focused on digital media users in Asia), the small-scale qualitative interviews, and the one-minute duration constraint of the PDTM for A/B Choice, this short timeframe fails to capture long-term interaction effects, such as whether users' preference for quantum-inspired dynamic elements persists beyond brief engagement, or if prolonged exposure to these elements is linked to sensory adaptation that diminishes their appeal. Future research could address these gaps by expanding to cross-cultural samples, scaling up qualitative interviews, extending the A/B Choice timeline to explore long-term user behaviour, and integrating AI-driven media to further explore I∩I in emerging digital paradigms.

Conclusion

This research in the context of IYQ 2025, concludes by summarizing the study's core contributions, practical implications, and limitations. The introduction of the Interaction-with-Interference (I∩I) framework fills three critical gaps: it provides a systematic tool to analyse interaction-interference dynamics, integrates Quantum-like Society principles into media spectacle research, and redefines interference as a dualistic force, both disruptive and generative.

Theoretical contributions include the I∩I pyramid categories (Table 1), which organize interference into actionable types (Perceptual, Mnemonic, Social) for future media research, and the link between quantum principles (superposition, uncertainty) and interactive spectacle, validating the Quantum Society metaphor as a useful lens for digital age analysis. Empirical contributions include the finding that quantum-inspired design enhances user engagement (67.1% preference) and that Uncertainty/Superposition are top artistic inspirations, providing practical guidance for interactive animation and media design.

Practically, I∩I offers a tool to address contemporary digital challenges: for example, using interference aesthetics to design media that balances engagement with critical thinking (e.g., highlighting filter

bubbles through interactive art). Limitations include sample homogeneity and small-scale interviews, but these also point to future directions—cross-cultural studies and AI-driven media applications.

Ultimately, this research emphasizes that interference is not a barrier to digital experience but a vital component of it. By embracing I∩I, scholars and designers can create media that harmonizes technological advancement with humanistic values, fostering a more critically engaged and creative digital society.

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